European Journal of Sustainable Development (2022), **11**, 3, 149-166 ISSN: 2239-5938
Doi: 10.14207/ejsd.2022.v11n3p149

The Evolution of Nominal Convergence After Accession to The European Union. The Case of Romania

By Elena Florentina Matei[1*], Ioana Manuela Mindrican[1]

Abstract
Economic and Monetary Union is the result of progressive economic integration that includes collective regulation for the free movement of goods, services, labor, capital, and products. Economic and Monetary Union presupposes a common currency and market, but also a monetary policy coordinated by the European Central Bank, which has the role of ensuring economic stability. In this context, the countries wishing to join must be prepared to deal with possible economic imbalances, this being possible through the existence of a high level of economic development. Through this paper, we want to identify the evolution of the nominal convergence criteria established by the provisions of the Maastricht Treaty to identify the level of readiness of the Romanian economy for integration into the Economic and Monetary Union.

Keywords: Integration, Eurozone, accession, Covid-19 pandemic

1. Introduction

Romania joined the European Union on January 1, 2007, and since then it is a state with a derogation from the adoption of the single currency, being conditioned by the fulfillment of the nominal convergence criteria found in the Maastricht Treaty. Over time, there have been several targets for joining the Eurozone, but the results recorded and the economic situation in those periods did not allow this, which led to the postponement of the accession decision. In this context, to improve the economic situation, in 2019, the substantiation report for the adoption of the single currency was published by the "National Commission for the Substantiation of the National Plan for the adoption of the euro", which includes a detailed analysis of the economic situation and possible solutions on the period of preparation and measures necessary for accession to the Economic and Monetary Union. The adoption of the single currency is an important step after accession to the European Union, and its success depends on mobilizing political and social forces to continue the reforms needed to meet the criteria of nominal convergence for economic development and increased competitiveness. All of this can ensure the economy's ability to cope with any pressures and risks that may arise from the loss of the imbalance adjustment tool offered by monetary policy. Also, the adoption of the single currency implies obtaining some benefits, but we must not neglect the fact that this process can lead to more shocks and risks if the Romanian economy is not ready to take this step, but also due to the fact that two important instruments are lost macroeconomic adjustment, namely, the autonomy of monetary policy and exchange rate flexibility. In this context, the

| [1]University of Economic Studies, Bucharest, Romania
[*]Corresponding author

role of nominal convergence criteria is to create the fiscal discipline needed to ensure the sustainability of public finances and to maintain an economic environment conducive to economic development, in which monetary policy can ensure the fundamental objective of price stability. Precisely for these reasons, the accession of European states to the Eurozone is conditioned by the fulfillment of the nominal convergence criteria.

The motivation for choosing this theme is given by the topical issue it represents, having a significant impact on the process of joining the Eurozone. At the same time, this topic is relevant, because it is a controversial topic in the current context, as well as necessary for the evolution of the structure of the Romanian economy. The onset of the health crisis generated by the Covid-19 pandemic has led to a widening of macroeconomic imbalances through a sharp increase in government spending compared to revenues that have declined in the context of declining economic activity. This unfavorable situation has produced uncertainty about the possibility of joining the Eurozone, given the negative effects on nominal convergence. Thus, in the current context, it is necessary to discuss more and more about the process of adopting the single currency in order to identify the necessary measures to facilitate this process.

The main objective of this paper is to identify the level of fulfillment of the nominal convergence criteria in terms of identifying the possibility of joining the Eurozone, after the moderation of economic pressures following the Covid-19 pandemic.

This paper is structured in several distinct parts, as follows: (i) in the first part is the introduction, (ii) in the second part of the literature review, (iii) in the third part of the research methodology, (iv) in the fourth part the analysis of the macroeconomic indicators on public debt, budget deficit, inflation rate, long-term interest rate and exchange rate, (v) and in the last part, the conclusions are found.

2. Review of the Scientific Literature

Over time, European authorities have developed several conventions and treaties to regulate the functioning of the Eurozone. Thus, the European institutions have become responsible for overseeing European countries in the convergence process, and one of the most important treaties adopted is the Maastricht Treaty, according to which European countries must abandon their own currency and adopt a single currency when the situation allows them to make this transition. In the literature, convergence is defined as a process of narrowing the gap between states with different levels of development. The Maastricht Treaty established the criteria for nominal convergence to ensure the readiness of European states to adopt a single currency, and their accession will not cause imbalances or risk for those countries or for the Eurozone as a whole. These criteria relate to pricing stability, exchange rate stability, long-term interest rate, and sustainable and sound public finance. Specifically, the nominal convergence criterion of price stability assumes that the inflation rate during a year does not exceed more than 1.5 pp. The inflation rate of the first three European countries achieved the best results, while the criterion on the long-term interest means that it does not exceed in a year by more than 2 pp. the rate of the first three European countries with the best results on price stability. The indicator through which the convergence of interest rates can be assessed is represented by the dynamics of long-term government bond yields.

Regarding the exchange rate criterion, it must be within the fluctuation margins of MCS II (Exchange Rate Mechanism) for at least two years without significant deviations and not devalue the bilateral central exchange rate of its currency against the euro. in the same period. The purpose of this mechanism is to stabilize the currencies of non-euro area states by establishing by common agreement a central and fixed, but adjustable exchange rate against the euro, as well as a standard fluctuation range of +/- 15%. As significant progress on convergence is made, a narrower range of fluctuations can be established. Regarding public finance, the public debt criterion assumes that it does not exceed 60% of GDP, while the budget deficit criterion assumes that it does not exceed 3% of GDP to ensure the sustainability of public finances. Numerous studies on the reference values of the nominal convergence criteria are identified in the literature. Specifically, the authors (Lewis, 2007) and (Dobrinsky, 2006) believe that the integration of the latter states has led to a decrease in the reference limit, while the author (Jonas, 2007) considers that the existence of a single reference limit for all states it is not relevant, but rather it would be appropriate to set two benchmarks depending on the stage of the business cycle of the countries preparing to adopt the single currency. However, the benchmarks of nominal convergence will not change, and European countries must make the necessary efforts to meet the convergence criteria to adopt the single currency. Regarding the effects of the pandemic, the European Court of Auditors' document (2020) states that this may lead to budgetary divergence between European countries, and the Commission is of the opinion that public debt will increase sharply, especially in countries already facing a high level, this situation being negatively influenced by the decrease of the GDP. In addition, nominal convergence is structured in three main phases which consist of the pre-accession and post-accession periods to the European Union, but also euroization (Iancu, 2009). Romania is currently in the post-accession phase and will remain in this phase until it adopts the euro, and in this context, it must make every effort to adopt a single currency, while meeting the convergence criteria. Moreover, at this stage, the degree of freedom is significantly restricted due to the imposition of convergence criteria in the conditions of total liberalization of capital flows and trade. This situation has led to several debates on exchange rate stability and inflation reduction, known as the Balassa-Samuelson effect, which will be discussed in detail in another paper.

Finally, the adoption of the single currency brings both benefits and costs for Romania, but from the point of view of convergence criteria, the costs will be lower as there is a lower level of divergence between trade structures and economics with those of the Eurozone, but also if there is a strong correlation between business cycles (Marinaș, 2013). Most of the studies found a focus on real convergence because there must be a high level of synchronization of countries on the road to the monetary optimum. Lack of synchronization can lead to high discrepancies between European economies (Artis, 2003), but nevertheless, nominal convergence should not be neglected, because without meeting these criteria, countries cannot adopt a single currency. An example of the importance of convergence criteria is given by the PIIGS countries (Portugal, Ireland, Italy, Spain, and Greece), which faced strong imbalances with the onset of the international financial crisis in 2008.

3. Research Methodology

This paper is based on a mixed methodology, as it is based on both quantitative and qualitative data. Regarding the qualitative data, they focused on the method of descriptive analysis, used to review the literature and achieve the stage of knowledge. Regarding the quantitative data, they aimed at a macroeconomic analysis, more precisely the data were introduced in the Microsoft Excel program and for easier identification of the evolution of macroeconomic indicators on public debt, budget deficit, inflation rate, long-term interest rate and exchange rate, various graphs were made.

In addition, with the help of the EViews econometric program, the multiple regression of the dependent variable (public debt) and the independent variables (budget balance and inflation rate) was performed. Finally, yet importantly, a forecast of the public debt for the period 2022-2025 was made in the Excel program.

To carry out this work, the database taken from the Eurostat website on the macroeconomic indicators mentioned above in Romania, for the period 2007-2020, was used. The analysis starts in 2007, because this is the year of Romania's accession to the European Union, being a milestone in the country's history.

4. Results and Discussion

4.1 The evolution of public debt

The public debt registered in the period 2007-2014 an ascending trend, and in the period 2015-2018 a downward trend, but with all these developments, the ratio of public debt to GDP was within the limit of 60% of GDP imposed by the Maastricht Treaty. The increase in public debt in the first part of the analyzed period occurred against the background of increased public spending, increased consumption, and reduced production capacity compared to investment. The increase in public debt in 2010 was influenced by borrowing to finance the budget deficit and refinancing public debt, but also by issuing guarantees for the government program "First House". Regarding the reduction of public debt since 2014, it occurred against the background of the registration of primary surplus, the existence of sustained economic growth, lower interest rates on attracting loans, reducing the budget deficit, but also the higher GDP growth rate than increasing debt. In the context of the improvement of the economic situation in 2017, the rating agencies reconfirmed Romania's rating based on the perspectives regarding the low level of public debt and solid economic growth. Contrary to this situation, the accentuation of the debt in 2019 led to the worsening of the economic situation, and in the absence of nonapplication of corrective fiscal budgetary measures, Romania's rating was revised, concluding that the country's perceptions are not stable at all.

The onset of the health crisis generated by the Covid-19 pandemic has led to a reduction in economic activity and an increase in public debt amid a sharp increase in spending and declining public revenues. This situation has been caused by the measures taken by the authorities to reduce the negative effects of the pandemic, among which we find the postponement of payments for more tax obligations by economic agents, increase of expenses for subsidies, granting various allowances to support labor, an increase of expenses for protection and others.

During the analyzed period, the public debt was within the imposed limit, but nevertheless, the registered level is high for the Romanian economy, and the sustainable level is 40-45% of GDP so that the economy is not exposed to risks.

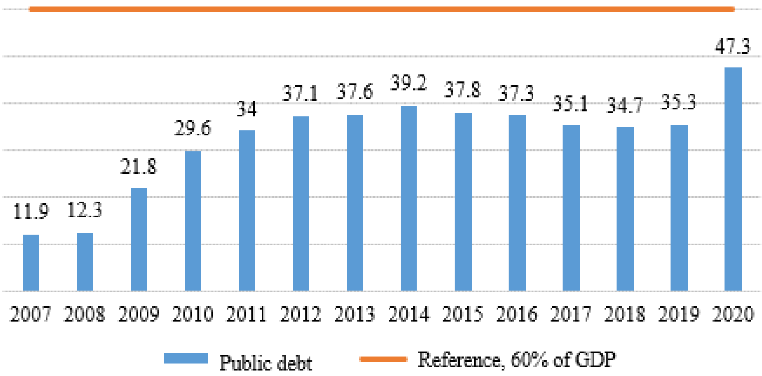


Figure no. 1: The evolution of public debt (% of GDP).
Source: Eurostat, https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_10dd_edpt1&lang=en

4.2 The evolution of the budget deficit

The budget deficit registered in the analyzed period various fluctuations depending on the economic context and the measures taken by the authorities. Its increase since the beginning of the analyzed period occurred in the context of the overheating of the economy, where part of it was financed by net inflows of other investments such as external loans. In this context, there was a significant deterioration of Romania's net investment position, for example from -19.3% in GDP (1998) to -46.6% in GDP (2007). In the period 2009-2015, we can see the tendency to reduce the budget deficit which reached in 2009 a much higher level compared to the limit found in the provisions of the Maastricht Treaty. The factors that have contributed to the widening of the budget deficit are the increase in public spending, the decline in the collection of public revenues due to economic recovery expectations, and tax evasion. The reduction of the budget deficit from 2009-2015 was due to the increase in the absorption of European funds, unemployment benefits, economic growth, and an increase in budget revenues in the context of measures to reduce tax evasion undertaken by the National Agency for Fiscal Administration. These measures consisted of controlling attempts at fraud and noncompliance with VAT laws, strengthening income tax obligations, and increasing control for large taxpayers. Additionally, in 2011-2013, a program was put in place that included measures to sustainably adjust public spending and increase the tax base to prevent indebtedness at a level where access to finance would have been difficult. In this context, fiscal consolidation, announced in a timely manner and implemented on the side of public spending alongside structural reforms, has led to a strengthening of confidence in fiscal sustainability and a reduction in interest rate risk premiums, which has contributed to economic stability. In 2015, the lowest level of budget deficit, was registered due to the application of the public investment reform, the stimulation of consumption simultaneously with the provision of social protection for the low-income population, and the indexation of pensions by 5%. Regarding the period 2016-2020, we can observe the upward trend of the budget deficit which was influenced by the unfavorable budgetary position aimed at increasing public spending in the field of long-term care and health, those with wages and currents, along with raising old-age pensions. The sharp deepening of the budget deficit in 2019 occurred due to expenditures made in the second half of the year to make payments based on court decisions to settle financial obligations, reduce taxes, increase pensions, make payments of about 1.3 billion lei representing capital and operating expenses of the territorial administrative units and to lower receipts from the dividends of companies under the state control.

The onset of the health crisis has led to a sharp increase in public spending, especially in the field of health and the implementation of measures to reduce the negative effects of the Covid-19 pandemic that have led to a significant reduction in revenues. Thus, based on the increase in public spending and borrowing, the level of public debt has risen sharply this year, considerably exceeding the limit imposed by the provisions of the Maastricht Treaty. In this context, Romania managed to meet this criterion of nominal convergence only in the period 2013-2018 and starting with 2019 the situation has changed significantly, the deficit limit of 3% of GDP being exceeded.

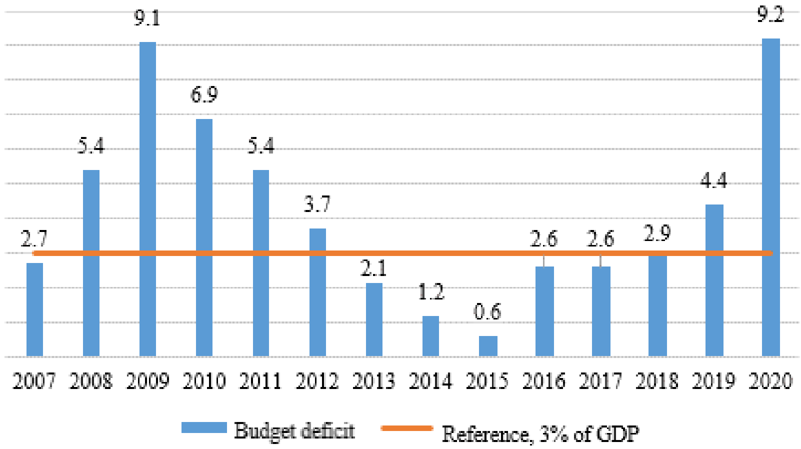


Figure no. 2: The evolution of the budget deficit (% of GDP)
Source: Eurostat, https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_10dd_edpt1&lang=en

4.3 The evolution of inflation rate

In the analyzed period, the 2007-2020 inflation rate predominantly registered a downward trend, but nevertheless, the level registered is far from the one imposed in the provisions of the Maastricht Treaty. The onset of the financial crisis in 2008 led to rising inflation, creating uncertainty in the economy, especially in the global economy, and its influence on the national economy, manifested through trade relations. Inflationary pressures also emerged amid the mismatch between the number of employees and labor productivity, and the entry of the economy into recession in 2009 led to lower inflation due to declining wages, exchange rates, and demand deficits.

In the following years, there were various fluctuations depending on the measures taken by the authorities, which consisted mainly in improving the economic situation by reducing future risks. In the period 2015-2016, for the first time since the transition to a market economy, there was a negative level of inflation in the context of keeping inflation expectations low, reducing MTPL policies and the price of tobacco products, but also reducing VAT rate from 24% to 20%. After this period, more precisely in 2017-2018, there was an increase in the inflation rate due to the improvement of the economic situation, the increase in food and fuel prices, the depreciation of the national currency, while in 2019 there was a decrease in the inflation rate due to decreases in the price of natural gas and volatile products, starting with July 2019.

Regarding the impact of the health crisis generated by the Covid-19 pandemic on the inflation rate in 2020, it led to a decrease in inflation by affecting the hotel sector, the transport sector, but also by lowering prices for energy products. At the same time, a strong impact was given by the significant decrease in the price of oil due to the sharp decrease in demand in the context of the restriction of economic activity and work at home. However, during the analyzed period, Romania predominantly registered a higher level of inflation rate compared to the limit imposed in the Maastricht Treaty, which led to the nonfulfillment of this nominal convergence indicator. The exception to this period is the years 2014-2017, in which the level of the inflation rate was lower compared to the level recorded by the three best performing European states plus 1.5 pp. It can also be seen the tendency to reduce the level of the inflation rate in the last part of the analyzed period, which indicates an improvement of the price stability trend at the level of the Romanian economy.

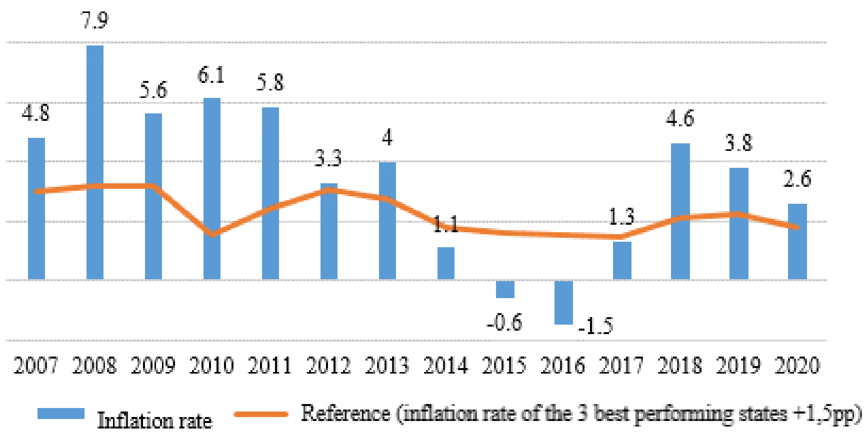


Figure no. 3: The evolution of inflation rate (% of GDP)
Source: National Institute of Statistics, http://www.insse.ro/cms/ro/content/ipc%E2%80%93serie-de-date-anuala

4.4 The evolution of the long-term interest rate

During the period under review, the long-term interest rate fluctuated according to the economic context and the decisions taken by the authorities at that time. Regarding the period 2007-2009, this indicator showed an upward trend amid rising inflation and improves outlook following significant economic and financial shocks in the internal and

external markets. The significant increase in the long-term interest rate was due to the intensification of the financial crisis in 2008 and its spread in domestic markets. After 2009 (figure no. 4), there is a trend of a gradual decrease in the long-term interest rate, in the context of the improved outlook on the inflation rate in line with the decrease in the risk premium, the decline in economic activity and the easing of market conditions. monetary. In recent years, there has also been an increase in the long-term interest rate in the context of uncertainty about the outlook for the economy and a higher level of risk aversion.
Regarding the observance of the limit of this criterion provided in the Maastricht Treaty, the Romanian economy managed only in the period 2013-2016, being significantly influenced by the economic context.

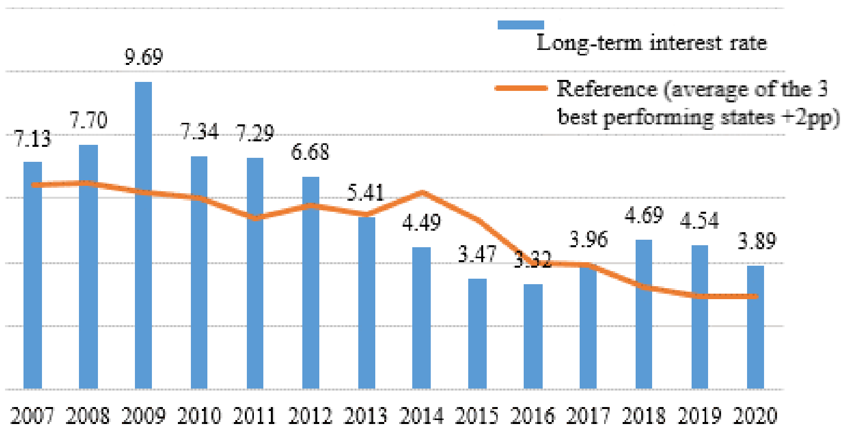


Figure no. 4: The evolution of the long-term interest rate (% of GDP)
Source: Eurostat, https://ec.europa.eu/eurostat/databrowser/view/IRT_LT_MCBY_A__custom_974729 /default/table?lang=en

4.5 The evolution of exchange rate

Regarding the analyzed period, Romania did not participate in MCS II (Exchange Rate Mechanism), the exchange rate continuing to be traded without assuming the central parity in relation to the single currency. However, in the period 2007-2020, the exchange rate predominantly showed an upward trend, which means its gradual depreciation against the euro. The 2007 depreciation was due to the increased risk aversion of global financial markets, concerns about the account deficit, and inflation rate, but also financial turmoil. Subsequently, this depreciation continued amid the reduction in external financing, the current account deficit reflected in the current account, the reduction in foreign investment, and the increase in the budget deficit. In this unfavorable context, the measures taken by the authorities supported the exchange rate not to depreciate further.
The importance of the exchange rate analysis is given by its influence on price stability and economic growth, which is felt in external competitiveness and wealth of households and firms.

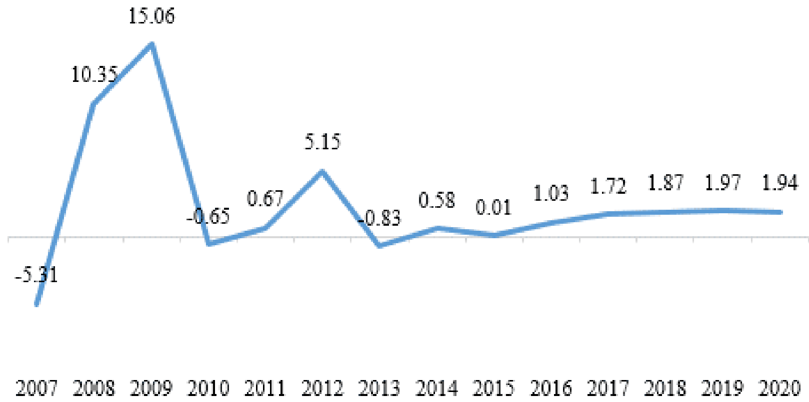


Figure no. 5: The evolution of annual exchange rate (Ron/Eur)
Source: The National Bank of Romania, https://www.bnr.ro/Cursul-de-schimb-3544.aspx

4.6 The impact of the pandemic on convergence

In recent years, there has been economic growth based on consumption in Romania, supported by pro-cyclical fiscal policies. This situation has led to a widening of external imbalances and a worsening of macroeconomic indicators. Specifically, there was an increase in the budget deficit and public debt, but also a level of inflation above the average of European countries. The year 2020 is marked by the onset of the Covid-19 pandemic, which is an unprecedented challenge to economic resilience and has highlighted the fragility of progress in convergence. Furthermore, the promotion of an expansionary budgetary policy in recent years has led to noncompliance with the convergence criterion on the budget deficit in 2019, which triggered the excessive deficit procedure for Romania. This situation has been severely affected by the measures taken by the authorities on budget expenditures to reduce the negative effects of the pandemic, which led to a sharp increase in the budget deficit (9.2% of GDP in 2020) and public debt (47.3% of GDP in 2020).

Regarding the structure of budgetary expenditures in 2020, it has changed compared to the previous year, and the measures taken have led to a deterioration of the budgetary position. According to the December 2020 budget execution, expenditures increased by 5.9 pp. (From 34.9% of GDP in 2019 to 40.8% of GDP in 2020), as a result of measures to reduce the effects of the Covid-19 pandemic. Regarding social assistance expenditures, they registered an increase of 20.8% compared to 2019 (138, 55 billion lei in 2020), being influenced by the increase of the pension point (from 1265 lei to 1442 lei), the social allowance granted to pensioners (from 704 lei to 800 lei), the increase of allowances and especially the exceptional measures taken regarding the pandemic. These measures consisted of allowances granted in the amount of (a) 4.25 billion lei for the temporary suspension of individual employment contracts at the initiative of the employer, (b) 922.13 thousand. lei for persons who have concluded work agreements that interrupt the activity as a result of the pandemic, (c) 2.69 billion lei granted to employers regarding the settlement of a part of the gross salary, (d) 96.15 million lei for parents left at home for the supervision of children during the period of temporary closure of educational units and

(e) 121.9 million lei granted to professionals and persons who had concluded employment agreements based on Law 1/2005. Moreover, the increase in budget expenditures from 2020 was significantly influenced by expenditures on goods and services on additional payments for medicines, health materials, and other products needed to diagnose and treat the population infected with Sars-Cov-2, which increased by 6, 9% compared to the previous year (57.05 billion lei in 2020). In addition, medical emergency products were purchased, including thermal scanners to reduce the spread of the new virus, amounting to 561.2 million lei. Thus, the structure of budget expenditures has changed significantly compared to 2019 amid the Covid-19 pandemic, with the authorities focusing on limiting the spread of the virus and treating infected patients.
Another effect of the pandemic on nominal convergence is given by the significant deterioration of the fiscal position in 2020, which, in the context of the amplification of the external imbalance and economic contraction, generated pressure on the risk premium. The increase of the risk premium on the background of instability determines the increase of long-term interest rates, the depreciation of the exchange rate, and the strong variation of the inflation rate between positive and negative values. This unfavorable situation will affect the nominal convergence and implicitly the process of adopting the single currency, which will have a significant impact on financing costs and the pace of economic recovery.
Regarding the real dynamics of GDP (figure no. 6), it can be seen how it has registered a downward trend in recent years, being strongly influenced by the measures taken by the authorities to reduce the negative effects of the pandemic. This trend of real GDP dynamics has a significant impact on long-term interest rates and prices, in the sense of increasing them. In this context, the fiscal-budgetary policy of 2020 focused on combating the negative effects of the crisis generated by the Covid-19 pandemic, and after overcoming it, measures will be considered to support the economic recovery. As can be seen, the economic situation and public spending in recent years, and especially in 2020, have had a negative impact on nominal convergence indicators that do not meet the limits imposed by the Maastricht Treaty.

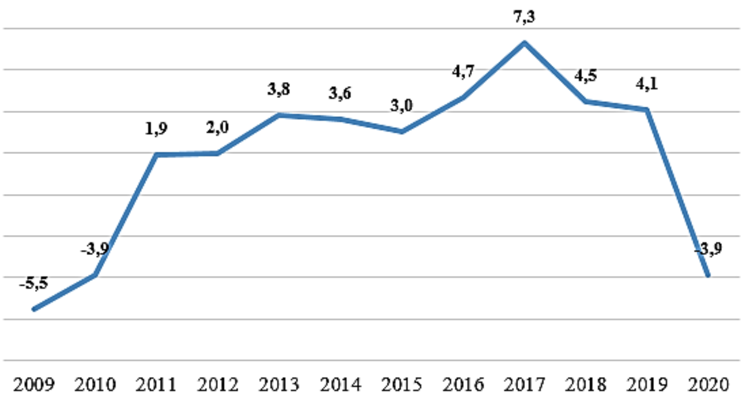


Figure no. 6: The real dynamics of GDP in the period 2009-2020
Source: Eurostat, https://ec.europa.eu/eurostat/web/products-datasets/-/tec00115

4.7 Econometric testing of economic variables

The level of public debt is influenced by a number of factors that can have a lower or higher intensity as well as a positive or negative direction. In this sense, a multiple regression model will be created to identify the impact of certain economic factors on government debt. It should be noted that this model will be used to make a forecast of the public debt in the coming years. Based on the multiple regression model, the impact of the inflation rate and the budget balance on the Romanian government debt is analyzed. The model has the following form:

DEBT= C+INF+BUDGET DEFICIT+ ʊ

DEBT= government debt
C= constant
INF= inflation rate
BUDGET DEFICIT = budget deficit
ʊ= errors

Table no. 1: Public debt and factors that can influence public debt.

	Public debt	Budget deficit	Inflation rate
2007	11.9	-2.7	4.8
2008	12.3	-5.4	7.9
2009	21.8	-9.1	5.6
2010	29.6	-6.9	6.1
2011	34	-5.4	5.8
2012	37.1	-3.7	3.3
2013	37.6	-2.1	4
2014	39.2	-1.2	1.1
2015	37.8	-0.6	-0.6
2016	37.4	-2.6	-1.5
2017	35.1	-2.6	1.3
2018	34.7	-2.9	4.6
2019	35.3	-4.4	3.8
2020	47.4	-9.4	2.6
2021	49.3	-8	5.1

As a result, the adoption of the euro represents an incentive for Romania, as a member state of the European Union, but at the same time, an economic reason for the states in the euro area so as to maintain an appropriate macroeconomic level and according to the requirements presented in the Maastricht Treaty.

Dependent Variable: PUBLIC_DEBT
Method: Least Squares
Date: 08/30/22 Time: 21:05
Sample (adjusted): 2007 2021
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLATION_RATE	-3.041104	1.113753	-2.730503	0.0182
BUDGET_BALANCE	-1.709750	1.032198	-1.656417	0.1235
C	36.65749	4.767357	7.689268	0.0000

R-squared	0.384538	Mean dependent var	33.36667
Adjusted R-squared	0.281961	S.D. dependent var	10.73756
S.E. of regression	9.098706	Akaike info criterion	7.430998
Sum squared resid	993.4375	Schwarz criterion	7.572608
Log likelihood	-52.73249	Hannan-Quinn criter.	7.429490
F-statistic	3.748776	Durbin-Watson stat	0.673984
Prob(F-statistic)	0.054351		

Figure no. 7: Model of public debt with the factors that affect it.

The econometric program Eviews reports for each independent and constant variable, the standard error of the coefficient, the t-statistic and its associated probability. In most situations, we work at the relevance level of 5%, and in the situation where the probabilities of the t-statistical test are lower than this level, the coefficients are considered statistically significant. As for the Durbin Watson statistical test, it tests the serial correlation of errors. If the errors are not correlated then the value of this test will be around 2. Consequently, according to the results obtained, this indicator registering the value of 0.67 reflects the fact that the errors are not correlated.
After processing the data in Eviews, the regression model has the following form:
DEBT= C+INF+BUDGET DEFICIT+ ʊ
DEBT= 36.65 C -3.04 INF- 1.70 BUDGET DEFICIT
Among the assumptions of the multiple regression model is that no independent variable is a linear function of other independent variables, more precisely there is no multicollinearity problem, which means that there should be a relationship between public debt, budget deficit and inflation linear. Also, in the work of the author Bucevska (2009), it is stated that if the result of the t-statistic test of the model exceeds the selected critical value, which means that the level of the estimated coefficient is statistically significant, more precisely the coefficient is different from 0. At the same time, the more the probability value is higher, the independent variables, less significant or more precisely, if the probabilities are greater than 5% then the variables are insignificant, according to Hansen (2016). In this sense, according to the results obtained it can be concluded that the probability of an independent variable has a value of less than 5%, which means that it is significant and has a strong impact on public debt. Specifically, this reflects the fact that inflation exerts a major impact on Romania's government debt.
As a result of the previously obtained results, it can be concluded that the entire economic context is uncertain and ambiguous, given the fact that the influence of the budget balance is reduced on the level of public debt in Romania, more precisely, it has a smaller influence

in relation to the other factor .

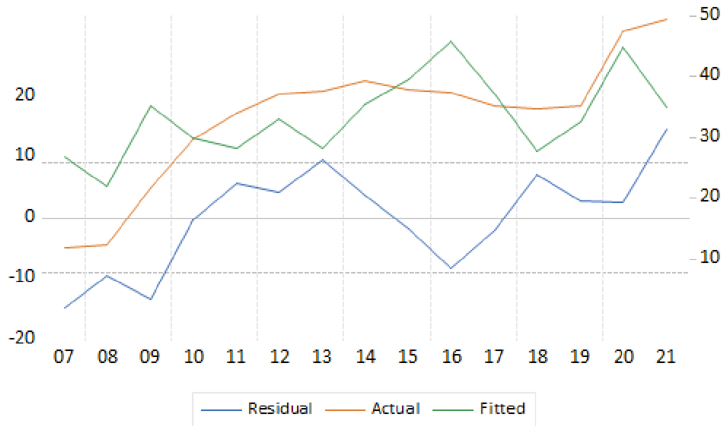
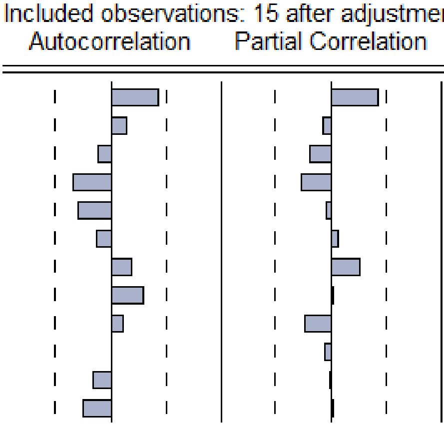


Figure no. 8: Actual value of the dependent variable

The graphical representation of the actual value of the dependent variable, its estimated value and the errors in the regression was obtained using the Eviews econometric program, as previously mentioned, starting from the estimated equation of the dependent and independent variables by selecting the option View/ Actual, Fitted, Residual/ Actual, Fitted, Residual/Graph.

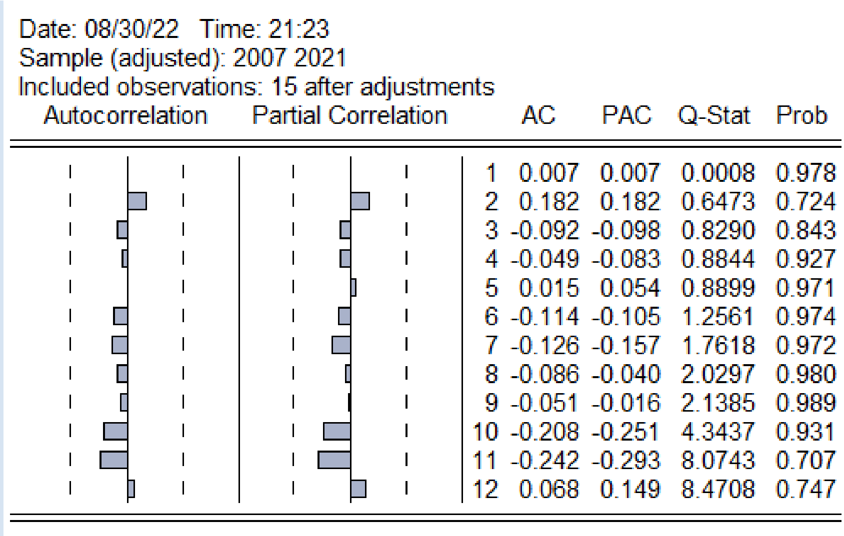
Date: 08/30/22 Time: 21:18
Sample (adjusted): 2007 2021
Included observations: 15 after adjustments



	AC	PAC	Q-Stat	Prob
1	0.448	0.448	3.6503	0.056
2	0.143	-0.072	4.0494	0.132
3	-0.118	-0.194	4.3472	0.226
4	-0.348	-0.272	7.1471	0.128
5	-0.308	-0.042	9.5613	0.089
6	-0.125	0.077	10.001	0.125
7	0.204	0.273	11.328	0.125
8	0.295	0.026	14.506	0.070
9	0.122	-0.239	15.138	0.087
10	0.009	-0.062	15.142	0.127
11	-0.170	-0.011	16.987	0.108
12	-0.260	0.023	22.718	0.030

Figure no. 9: Regression equation error testing

Next, the option View/Residual Diagnostic/Correlogram-Q-Statistic tests the autocorrelation of the errors of the regression equation.



Date: 08/30/22 Time: 21:23
Sample (adjusted): 2007 2021
Included observations: 15 after adjustments

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.007	0.007	0.0008	0.978
		2	0.182	0.182	0.6473	0.724
		3	-0.092	-0.098	0.8290	0.843
		4	-0.049	-0.083	0.8844	0.927
		5	0.015	0.054	0.8899	0.971
		6	-0.114	-0.105	1.2561	0.974
		7	-0.126	-0.157	1.7618	0.972
		8	-0.086	-0.040	2.0297	0.980
		9	-0.051	-0.016	2.1385	0.989
		10	-0.208	-0.251	4.3437	0.931
		11	-0.242	-0.293	8.0743	0.707
		12	0.068	0.149	8.4708	0.747

Figure no. 10: Autocorrelation testing

According to the results obtained based on this test, it can be seen that for the error lags there is no serial correlation of errors because the value of the autocorrelation coefficient does not exceed the dotted range.

Next, through the View/Residual Diagnostic/ Correlogram residual option, the autocorrelation of the quadratic errors of the regression equation is tested according to the same principles as testing the autocorrelation of the errors. Thus, if there is autocorrelation of the squared errors, this fact indicates the existence of heteroscedasticity. Taking into account the results obtained from the present research, the idea that there is no heteroscedasticity of quadratic errors can be exposed.

4.8 Forecasting of public debt

Forecasting is known in the economic literature as a technique by which future trends are projected using conclusive statistics. Moreover, forecasting is a particularly complex and important process, because it offers the possibility of obtaining results and probabilities that would represent, at present, the best course of action. In this article, a forecast was made using Excel, because it offers a variety of tools in this field of activity, while also having a large capacity to store calculations and visualize data. The evolution of government debt has been an intensely debated issue, having a major impact on the decision-making process constituted an intensely debated issue, having a major impact on the decision-making process. In order to obtain this prediction, the quantitative method Exponential Smoothing, abbreviated ETS, was used, which is based on an algorithm for identification, but also for detecting seasonal patterns and confidence intervals.

Consistent with the resulting graph, the average level of government debt over the next 5 years fluctuates considerably. For example, the highest level will be recorded in the year 2025 of 57.36%. With a confidence of 95%, the expected result for the period of 2022-2025 will be in the range of 41.15-54.33. As a result of the footprints left by the COVID-19 pandemic, the migration of Ukrainian citizens against the background of the war started by Russia and the economic context of the Romanian state, it can be stated that the level of government debt will increase, and the macroeconomic picture that leads us towards joining the euro will be quite uncertain and unlikely for the next few years.

Timeline	Values	Forecast	Lower Confidence Bound	Upper Confidence Bound
2007	11,9			
2008	12,3			
2009	21,8			
2010	29,6			
2011	34			
2012	37,1			
2013	37,6			
2014	39,2			
2015	37,8			
2016	37,4			
2017	35,1			
2018	34,7			
2019	35,3			
2020	47,4			
2021	49,3	49,3	49,30	49,30
2022		51,31571	42,73	59,90
2023		53,33143	41,19	65,47
2024		55,34714	40,48	70,22
2025		57,36286	40,19	74,54

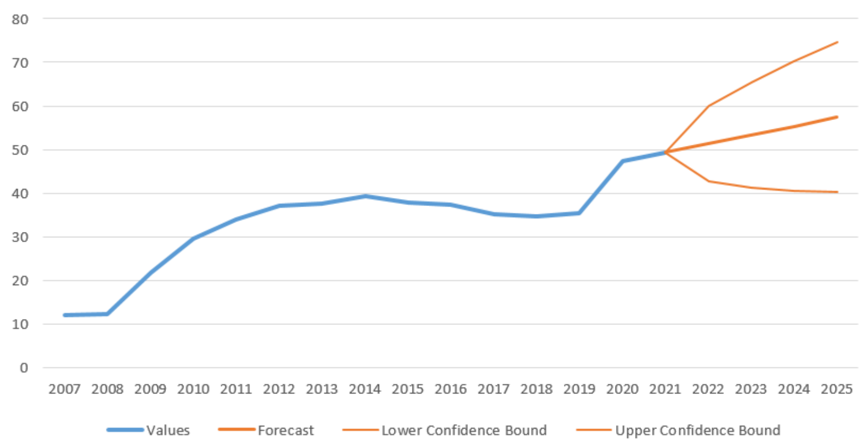


Figure no. 11: Forecasting of public debt 2022-2025

5. Conclusions

To fulfill the provisions found in the Maastricht Treaty, Romania must ensure the sustainable development of the economy. Regarding the analyzed period 2007-2020, the Romanian economy fully met only the criterion of public debt, which recorded in the period 2007-2019 a level below 40% of GDP, and in 2020 reached 47.3% of GDP in the context of the sharp rise in public spending to mitigate the negative effects of the Covid-

19 pandemic crisis. The criterion on the budget deficit was met only in the period 2013-2018 and in the period 2014-2017 the criterion on the inflation rate which registered a significant decrease due to the reduction of indirect tax rates, reaching an all-time low in 2016.

Regarding the exchange rate, it did not participate in the period analyzed in MCS II (Exchange Rate Mechanism), continuing to trade without assuming a central parity against the euro, and for this reason, it was not possible to analyze the inclusion of this criterion within the range established by the Maastricht Treaty. Regarding the criterion on the long-term interest rate, it was met only in the period 2013-2016. According to the analysis, it can be seen that in recent years there has been significant progress in Romania, but nevertheless, the results recorded are not sufficient for the transition to the Eurozone. For this reason, after reducing the negative effects generated by the Covid-19 pandemic, future fiscal measures must focus on economic development and improving macroeconomic indicators.

According to the provisions of the Maastricht Treaty, a country preparing to adopt the single currency must meet the criteria of nominal convergence, but these are not enough, because without structural and institutional compatibility, a balanced economy with convergence long-term correspondent, the accession process will not benefit the country concerned, and even more so that the economy will become a peripheral economy at the level of the Eurozone, less flexible and unable to reduce or eliminate its shocks independently. faces. In this context, a future direction of research may be to analyze the real convergence criteria on potential GDP growth, increase in total factor productivity, real GDP at purchasing power parity, and labor productivity per person employed. Moreover, another research direction could be to analyze the structural convergence of the Landesman and Krugman indices, or even the convergence of Romania's business cycle.

The main idea regarding the fulfillment of all the convergence criteria, for Romania, is to ensure that the Eurozone states have adequate economic conditions to maintain price stability and, implicitly, the coherence of the Eurozone. Therefore, the individual criteria are interpreted and applied in a strict manner. According to the specialized economic literature, at the beginning of the Monetary Economic Unit, the Maastricht criteria were not so strictly applied, on the other hand, currently many states that use the euro as their currency today do not meet all these criteria. Hence, the idea that Romania must take into account the fulfillment of these objectives in order to evaluate, over time, the evolution of nominal convergence.

Moreover, from the resulting analysis it emerged that Romania should not adopt the decision to switch to the euro zone before meeting all the criteria, because this brings with it high costs, especially if there is a high level of government debt. An eloquent example to support the previously mentioned information is that of the PIIGS states that face major problems related to the financing of public debt, problems that continue to significantly affect the economy of other European states as well.

In line with the economic literature, the evolution of nominal convergence for the euro area states illustrated that convergence is much higher in the case of long-term price and interest rate stability, while in the fiscal context there is no substantial improvement. Convergence of long-term interest rates has steadily increased and recorded the highest

level of convergence before the onset of the financial crisis in 2008, and the sovereign debt crisis and the crisis generated by the COVID-19 pandemic have led to the emergence of a significant number of challenges for Member States of the European Union.
Because of the previously obtained results, it can be concluded that the entire economic context is uncertain and ambiguous, given the fact that the influence of the budget balance is reduced on the level of public debt in Romania, more precisely; it has a smaller influence in relation to the other factor.

6. Acknowledgements

This paper was co-financed by The Bucharest University of Economic Studies during the PhD program.

References

Artis, M. (2003), *Analysis of European and UK business cycles and shocks*. http://image.guardian.co.uk/sys-files/Guardian/documents/2003/06/09/addevon03_316.pdf

Bisciari, P., Essers, D., Vincent, E. (2020), *Does the EU convergence machine sill work?*. https://www.nbb.be/doc/ts/publications/economicreview/2020/ecorevi2020_h2.pdf

Bucevska, V. (2009), *Ekonometrija so primena na EViews, Ekonomski fakultet, Skopje*

European Central Bank, Convergence Report (2007-2020). https://www.ecb.europa.eu/pub/convergence/html/index.en.html

European Court of Auditors (2020), *Risks, challenges and opportunities in the Eu`s economic policy response to the crisis caused by the Covid-19 pandemic.* https://www.eca.europa.eu/Lists/ECADocuments/RW20_06/RW_Economic_response_to_Covid19_RO.pdf

Dăianu, D., Fugaru, A., Georgescu, E., Mihailovici, G., Moinescu, B., Neagu, F., Panait, I., Stoian, B. (2020), *Romania – Euro Area Monitor, https://www.bnr.ro/Romania---Zona-Euro-MONITOR--22672.aspx*

Fedajev, A., Rădulescu, M., Babucea, A. G., Mihajlovic, V., Yousaf, Z., Milicevic, R. (2021), *Has Covid-19 pandemic crisis changed the EU convergence patterns?*, Economic Research, https://www.tandfonline.com/doi/full/10.1080/1331677X.2021.1934507

Georgescu, F. (2010), *Romania`s economic policies in order to adopt the euro*. Open Day for economists, National Bank of Romania, Bucharest

Gaspar, V. (2003), *Real and Nominal Convergence in the European Union*. https://www.ecb.europa.eu/press/key/date/2007/html/sp071120.en.html

Hansen, B.E. (2016), *Econometrics,* UK, pp.72-89

Iancu, A. (2007b), *Types of convergence. Institutional convergence.* Economic Review. http://oeconomica.org.ro/files/pdf/36.pdf

Iancu, A. (2009), *Nominal convergence*, Romanian Academy, Institute of Economic Research, http://www.studii-economice.ro/2009/seince090703.pdf

Isarescu, M. (2015), *Nominal convergence versus real convergence*. Romanian`s path towards the euro conference, National Bank of Romania, Bucharest

Isarescu, M. (2007), *Romania, the changeover to the euro.* National Bank of Romania, Bucharest

Marin, D., Socol, C., Marinas, M. (2004), *European Economy: a synoptic presentation.* Theoretical and Applied Economics Magazine

Marinas, M. C. (2010), *The Effectiveness of Fiscal Policy in Combating Economic Crisis. An Analysis Based on the Economic Literature*, Theoretical and Applied Economics Magazine, Volume XVII, No. 11(552), pp. 63-78, http://www.store.ectap.ro/articole/527.pdf

Marinas, M. C. (2013), Analysis of the risks of the adoption of the euro by Romania based on ten criteria. Theoretical and Applied Economics Magazine, Volume XX, No. 1(578), pp. 6-22, http://store.ectap.ro/articole/814_ro.pdf

Ministry of Finance, Budget Execution Information, https://mfinante.gov.ro/domenii/bugetul-de-stat/informatii-executie-bugetara

National Bank of Romania, Annual Report (2007-2019). https://www.bnr.ro/PublicationDocuments.aspx?icid=3043

National Bank of Romania, Periodicals. https://www.bnr.ro/Publicatii-periodice-204.aspx

National Bank of Romania, Occasional publications. https://www.bnr.ro/Studii,-analize,-puncte-de-vedere-4009.aspx

National Bank of Romania, Economic criteria. https://www.bnr.ro/Criteriile-economice-1247.aspx

National Bank of Romania, https://www.bnr.ro/Romania---statmembru-al-Uniunii-Europene-1245.aspx

National Bank of Romania, https://www.bnr.ro/Procesul-depregatire-pentru-adoptarea-monedei-unice-europene-8012.aspx#footnote1

Official Journal of the European Union (2012), *Treaty on the Functioning of the European Union (consolidate version).* https://eur-lex.europa.eu/legal-content/ro/TXT/PDF/?uri=CELEX:12012E/TXT&from=EN#page=62

Rangelova, R. (2021), *Economic growth and development of the concept of convergence – theoretical basis,* Economic Studies, https://www.researchgate.net/profile/Rossitsa-Rangelova/publication/352679715_ECONOMIC_GROWTH_AND_DEVELOPMENT_OF_THE_CONCEPT_OF_CONVERGENCE_-THEORETICAL_BASIS/links/60d2e887a6fdcce58baad586/ECONOMIC-GROWTH-AND-DEVELOPMENT-OF-THE-CONCEPT-OF-CONVERGENCE-THEORETICAL-BASIS.pdf

Vasiloiu, I.N. *The Romania's challenges regarding the integration in the Euro Area.* „Costin C. Kiritescu" National Institute for Economic Research, Romanian Academy, Theoretical and Applied Economics Magazine. http://store.ectap.ro/articole/1223.pdf